

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

1-48. (Canceled)

49. (New) A medical system, comprising:

- an implantable housing;
- a plurality of electrodes coupled to the implantable housing;
- an implantable audio sensor coupled to the implantable housing and configured to output a sound signal indicative of audio frequency cardiac sounds; and
- circuitry at least partially contained within the implantable housing, the circuitry configured to sense an electrical cardiac signal through the plurality of electrodes, detect heart sounds from the sound signal, discriminate between normal cardiac function and cardiac arrhythmia based on the electrical cardiac signal and the sound signal, and provide an output based on the discrimination between normal cardiac function and cardiac arrhythmia.

50. (New) The medical system of claim 49, wherein discrimination between normal cardiac function and cardiac arrhythmia comprises discrimination between normal heart rate and arrhythmic heart rate, wherein:

- the heart rate is indicated to be normal and the electrical cardiac signal subject to electrical noise if the electrical cardiac signal indicates high heart rate and the sound signal indicates normal heart sounds; and

- the heart rate is indicated to be arrhythmic if the electrical cardiac signal indicates high heart rate and the sound signal indicates modified heart sounds.

51. (New) The medical system of claim 49, wherein:

the cardiac function is determined to be normal if the electrical cardiac signal indicates abnormal cardiac morphology and the sound signal indicates normal heart sounds; and

the cardiac function is determined to be arrhythmic if the electrical cardiac signal indicates abnormal cardiac morphology and the sound signal indicates modified heart sounds.

52. (New) The medical system of claim 49, wherein discrimination between normal cardiac function and cardiac arrhythmia comprises identification of electrical noise and wherein the presence of noise is indicated if the electrical cardiac signal indicates high heart rate and the sound signal indicates normal heart sounds.

53. (New) The medical system of claim 49, wherein discrimination between normal cardiac function and cardiac arrhythmia comprises discrimination between normal sinus rhythm and one or both of ventricular tachycardia and fibrillation based on temporal correlation of cardiac sound features of the sound signal with electrical cardiac features of the electrical cardiac signal.

54. (New) The medical system of claim 49, wherein discrimination between normal cardiac function and cardiac arrhythmia is based on temporal correlation of S1 heart sounds of the sound signal with QRS complexes of the electrical cardiac signal.

55. (New) The medical system of claim 49, wherein the circuitry is configured to open a correlation window based on a cardiac cycle feature fiducial point of the electrical cardiac signal to correlate heart sounds with cardiac cycle features of the same heart beat over a plurality of cardiac cycles, wherein discrimination between normal cardiac function and cardiac arrhythmia is based on temporal correlation between heart sounds and cardiac cycle features over the plurality of cardiac cycles.

56. (New) The medical system of claim 49, further comprising a human input, wherein collection of the sound signal by the circuitry is initiated based on triggering of the human input.

57. (New) The medical system of claim 49, wherein the output comprises transmission of an indication of the discrimination between normal cardiac function and cardiac arrhythmia from the circuitry in the implantable housing to a patient-external medical device and storage of the indication in memory.

58. (New) The medical system of claim 49, wherein the audio sensor is disposed on a lead connected to the implantable housing

59. (New) The medical system of claim 49, wherein the audio sensor is at least partially contained within the implantable housing and the implantable housing and the plurality of electrodes form a rigid unitary structure.

60. (New) A method, comprising:

- sensing a cardiac electrical signal using a plurality of implantable electrodes;
- sensing, from within a patient, a sound signal indicative of audio frequency cardiac sounds of a patient;
- detecting heart sounds from the sound signal;
- correlating the heart sounds with cardiac features of the cardiac electrical signal; and
- discriminating between normal cardiac function and cardiac arrhythmia based on correlation between the heart sounds and the cardiac features, wherein at least one of correlating and discriminating is implemented at least in part using a circuit.

61. (New) The method of claim 60, wherein discriminating between normal cardiac function and cardiac arrhythmia comprises discriminating between normal heart rate and arrhythmic heart rate, wherein:

the heart rate is indicated to be normal and the electrical cardiac signal subject to electrical noise if the electrical cardiac signal indicates high heart rate and the sound signal indicates normal heart sounds; and

the heart rate is indicated to be arrhythmic if the electrical cardiac signal indicates high heart rate and the sound signal indicates modified heart sounds.

62. (New) The method of claim 60, wherein:

the cardiac function is determined to be normal if the electrical cardiac signal indicates abnormal cardiac morphology and the sound signal indicates normal heart sounds; and

the cardiac function is determined to be arrhythmic if the electrical cardiac signal indicates abnormal cardiac morphology and the sound signal indicates modified heart sounds.

63. (New) The method of claim 60, wherein discrimination between normal cardiac function and cardiac arrhythmia comprises identification of electrical noise and wherein the presence of noise is indicated if the electrical cardiac signal indicates high heart rate and the sound signal indicates normal heart sounds.

64. (New) The method of claim 60, wherein correlating the heart sounds with cardiac features of the cardiac electrical signal comprises correlating the timing of S1 heart sounds of the sound signal with QRS complexes of the electrical cardiac signal.

65. (New) The method of claim 60, wherein correlating the heart sounds with cardiac features of the cardiac electrical signal comprises opening a correlation window for each occurrence of a particular cardiac cycle feature fiducial point of the electrical cardiac signal and identifying a heart sound within each window.

66. (New) The method of claim 60, wherein the step of detecting heart sounds is initiated based on triggering of the human input.

67. (New) The method of claim 60, further comprising:

transmitting an indication of the discrimination between normal cardiac function and cardiac arrhythmia from a patient internal location to a patient-external medical device; and
storing the indication in memory.

68. (New) A medical system, comprising:

means for sensing a cardiac electrical signal using a plurality of implantable electrodes;

means for sensing, from within a patient, a sound signal indicative of audio frequency cardiac sounds of a patient;

means for detecting heart sounds from the sound signal;

means for correlating the heart sounds with cardiac features of the cardiac electrical signal; and

means for discriminating between normal cardiac function and cardiac arrhythmia based on correlation between the heart sounds and the cardiac features, wherein at least one of correlating and discriminating is implemented at least in part using a circuit.